FLIGHT

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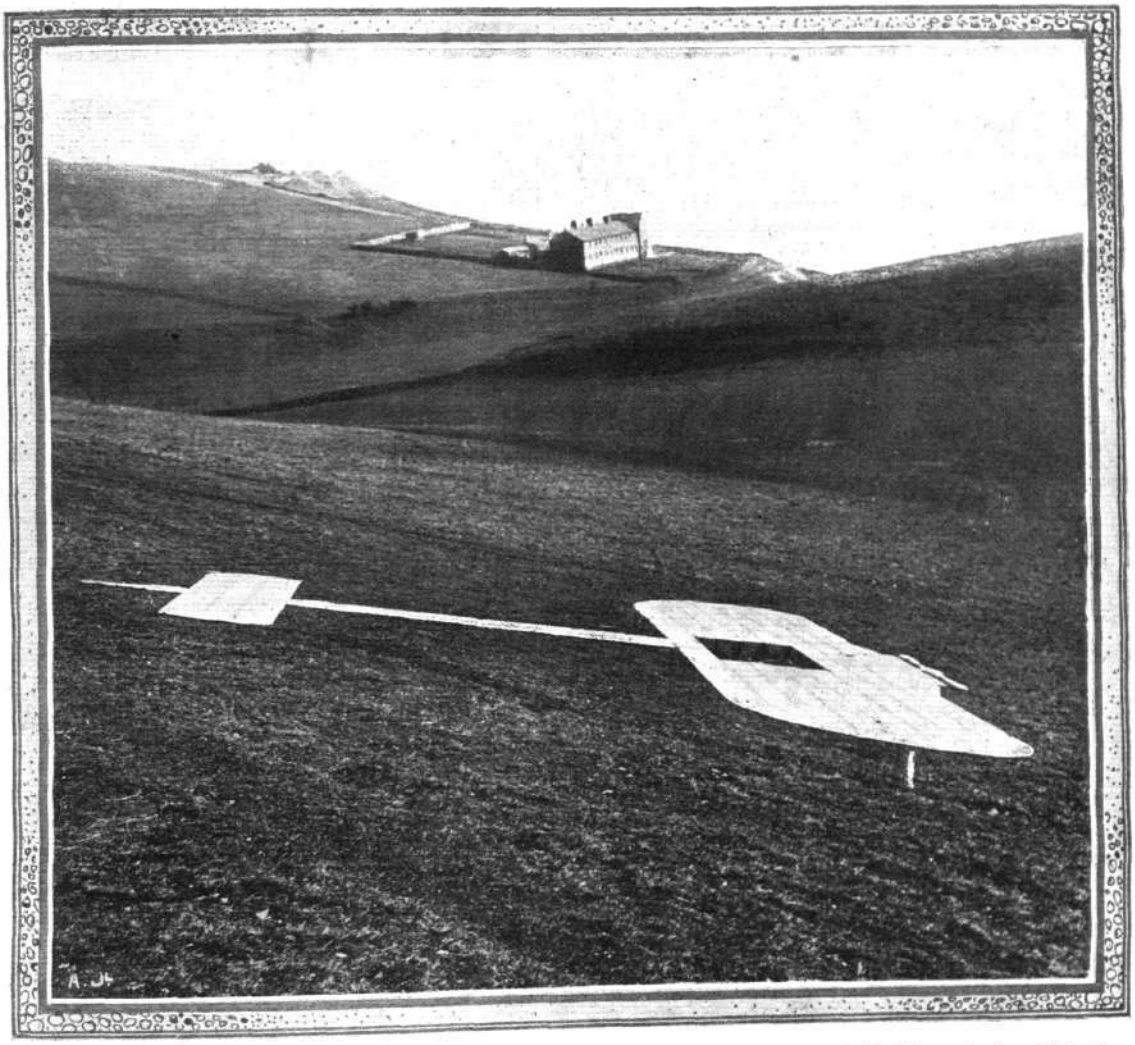


BLÉRIOT MEMORIAL AT DOVER.—In order to commemorate the great Channel flight of M. Blériot, the Aero Club at once announced their intention of erecting a monument upon the spot of landing. Mr. A. Duckham, a member of the Club, then generously offered to defray the cost of this, and a full-sized Blériot aeroplane, made in stone, and which is let into the ground at Dover, on the spot where Blériot landed, in the North Fall Meadow, just behind Dover Castle, is the form which this great monument has taken, as seen in our photograph.

AERONAUTICS FOR THE NAVY.

By GRIFFITH BREWER.

IT is, of course, possible that dirigibles similar to that now under construction at Messrs. Vickers, Sons and Maxim's, may be of use in naval warfare; but whether employed for scouting or for active attack, they must necessarily act as separate units and keep in touch with their protection sheds, be these floating or on land. They cannot reasonably be expected to go cruising with a fleet at sea, because the first gale encountered would mean their destruction. For cruising purposes, therefore, a fleet must rely on some means of aerial apparatus of a more portable character, which may be stowed on board a vessel, and when scouting or other aerial services are required, an ascent may be made regardless of the weather conditions at the time. One means that will be at the disposal of the Navy very shortly is the aeroplane, which is rapidly proving itself a most efficient vehicle for reconnoitring, and although its use has hitherto been confined to flights from land, I see no insuperable difficulties against launching and subsequently landing on a vessel at sea. The second means for providing longsight eyes to a fleet is the old spherical balloon, and it has always been a mystery to me why this splendid means of observation has not been used in the Navy nor any attempt been made to prove or disprove its value. I purpose dealing later in this article with a ready means for proving by experiment the feasibility of using the balloon at sea for observation and for other purposes. The aeroplane, however, now holds the favourite position in aeronautical enterprise, and so I will endeavour to suggest a method of its employment as a tender to a high-speed steamship.

In starting an aeroplane from a vessel under way, there would be no need to employ wheels for the initial start, nor would a starting rail or propelling catapult be required. It would be sufficient to propel the vessel from which the aeroplane is to be launched at a sufficient speed to enable the planes to receive the requisite amount of lift, and then to release the aeroplane, the aviator having his elevating planes set to the proper angle as though he were rising from a launching rail. The launching would take place from the bows of the vessel, preferably from a light upper deck without side rails, which would, in fact, have the appearance of a permanent awning and need not interfere with the duties of the men carried out on the usual deck below. The bows of the vessel would be directed against the wind and the speed of propulsion would be such as to add to the force of the wind sufficiently to cause the planes of the flying machine to lift, when, by releasing a catch, either by hand or automatically, on the required lift being obtained, the machine would rise and travel forward by reason of its own propellers. This method of starting would certainly be attended with some risk in the event of the aeroplane failing in its flight just after launching, but the danger of being run down by the following vessel could be entirely obviated by using a catapult starting apparatus, which would enable the machine to be launched when the vessel was stationary or only being propelled at a slow speed. The alighting on the deck at the end of the flight would be a more difficult matter, but should not be more dangerous than bringing a boat alongside in a moderate sea. It would require skill, certainly, but by the skill that is being displayed by men, with but a few months' pioneer experience, to-day, it would not need much excess of that skill to effect the necessary landing or boarding operation. The method of accomplishing this feat would be by bringing the vessel head to wind, and when thus directed sailing up alongside on the aeroplane whilst gradually converging towards the vessel. Both the ship and the aeroplane would be made to travel as nearly as possible at similar speeds, and the relative result would be the side approach of the aeroplane over the raised fore deck, where it would become practically stationary and could be secured. The machine would then be lowered on to the main deck aft of the raised deck, and would be stowed under cover ready to be brought out on the next occasion. There would, of course, be difficulties in the use of aeroplanes as suggested above, but there would also be the advantage unobtainable on land of securing a true wind unruffled by eddies and unexpected currents. It would probably not be possible to utilise any other portion than the bow of the ship for the starting deck, because of the eddies set up by the vessel as it advances, but this could be ascertained by experiment.

The value of aeroplane scouts to a fleet can hardly be over-estimated. They would warn the ships to which they belong of the approach of an enemy, long before its masts were in sight, and this without any danger of being themselves seen, because an aeroplane seen side or end on offers but a small mark for observation, and at ten miles would be quite invisible to the naked eye. They would also be of the greatest value for communicating with the shore, as no harbours would be required, and in the case of a fleet travelling along our coast, it would be possible to land in an aeroplane and rejoin the fleet without hindering its progress. But before the British Navy can utilise the aeroplane for all these services some of its officers must learn to manipulate it on land, and the aeroplane they will require will be the one which is capable of executing with the greatest ease and accuracy the sharpest movements and curves. It must also be a machine with the greatest strength in proportion to its weight, and consequently must be a biplane. Above all, however, should the naval authorities give some favoured young officers a chance to see what can be done, let us hope they will not disdain to take advantage of the work already accomplished by others. Thousands of pounds have been spent by the Aero Club and its members, and all knowledge and facilities thus acquired are at the disposal of the services when the authorities realise that the air is an element already invaded by man.

A ship equipped for aerial scouting will not be fully prepared for all weather conditions when provided with aeroplanes alone. At anchor it might be easy to launch an aeroplane by means of a catapult, but the boarding of the aeroplane on to the ship after the flight might be extremely difficult or even impossible in a calm with the ship stationary. In a heavy sea, with the ship plunging head to wind, it might also be extremely difficult either to be launched or to subsequently board the vessel; and it is on such occasions that the balloon could be used. The plunging or rolling of a ship would not affect the balloon, and the pressure of the wind if too high could be taken off the balloon by steaming slowly before the wind. In a calm the balloon is an infinitely superior means of observation to the aeroplane, because the latter must continue to travel at least at thirty miles an hour in order to support flight, whilst the balloon held captive at the end of a rope gives the observers time to take a careful survey of the surroundings without being in any

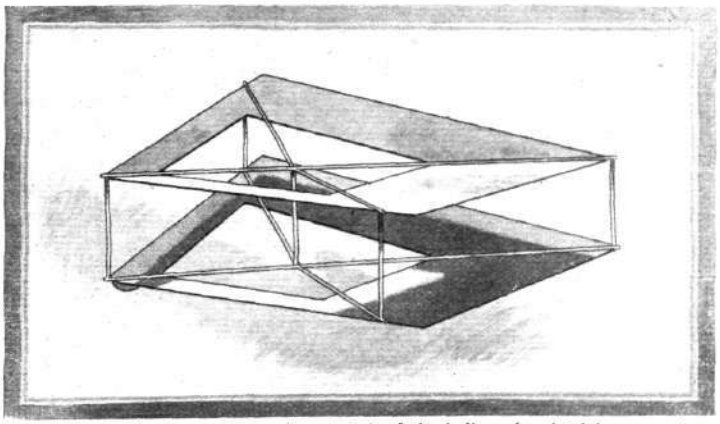
way disturbed. I know of no instance of a balloon being inflated and made to ascend from a vessel at sea, although Comte de la Vaulx made experiments over the Mediterranean, and Capt. Scott carried cylinders of hydrogen to the Antarctic and made some captive ascents on the Polar ice. There is thus a splendid opportunity for some enterprising balloonist such as Mr. Mortimer Singer to prove the value of the spherical balloon at sea in the interests of the Navy, and I make this suggestion because I know that he has the necessary courage and taste for the cross-sea adventure which can accompany the experiment. The balloon best fitted for the purpose would be one of 15,000 cu. ft. capacity, and the gas for inflation would be carried compressed in cylinders on board the vessel, which could conveniently be a large yacht. The balloon could be inflated on the deck whilst the vessel steamed before the wind for the purpose of taking the pressure of the wind off the balloon, and then captive ascents would be made and observations taken. No wind up to thirty miles an hour would prevent this experiment being carried out successfully; and I feel sure from similar experiments I have made with a 500 cu. ft. balloon inflated and manœuvred from a four-oared gig, that no difficulty would be experienced on the larger scale. Having carried out the experiments in the interests of the Navy, the reward of the aeronauts would be secured in making a cross-sea balloon trip under ideal conditions, for the captive ascent should be made to windward of some land, say one hundred miles distant, and a voyage on a buoyant trail rope could then be made to the distant land and far beyond if the search for adventure remained unsatisfied. Or if it be desired to add to science still further valuable data, the question of the amount of the steering capabilities of a balloon at sea could be settled by the aid of a steerable float governed by electrical current from the balloon to which it is held captive. I once towed a canoe by means of a 500 cu. ft. balloon from Teddington to Thames Ditton, guiding the canoe and balloon by means of the rudder only; and in order to do this it was necessary to steer 60° away from the direction of the wind at some times.

I should not expect to obtain this efficiency when the proportion between the air-borne portion, *i.e.*, the balloon, were larger than the portion drawn through the water, but if 20° of steerability could be secured, it would give the balloon a useful scope which it is not given the credit of possessing at the present time. In fact, the spherical balloon, owing to its compactness and efficiency in lifting power—not to say anything of its small cost when compared with dirigibles—offers great possibilities to naval manœuvres, whilst for sporting adventure at sea our wildest dreams of boyhood can still be satisfied.

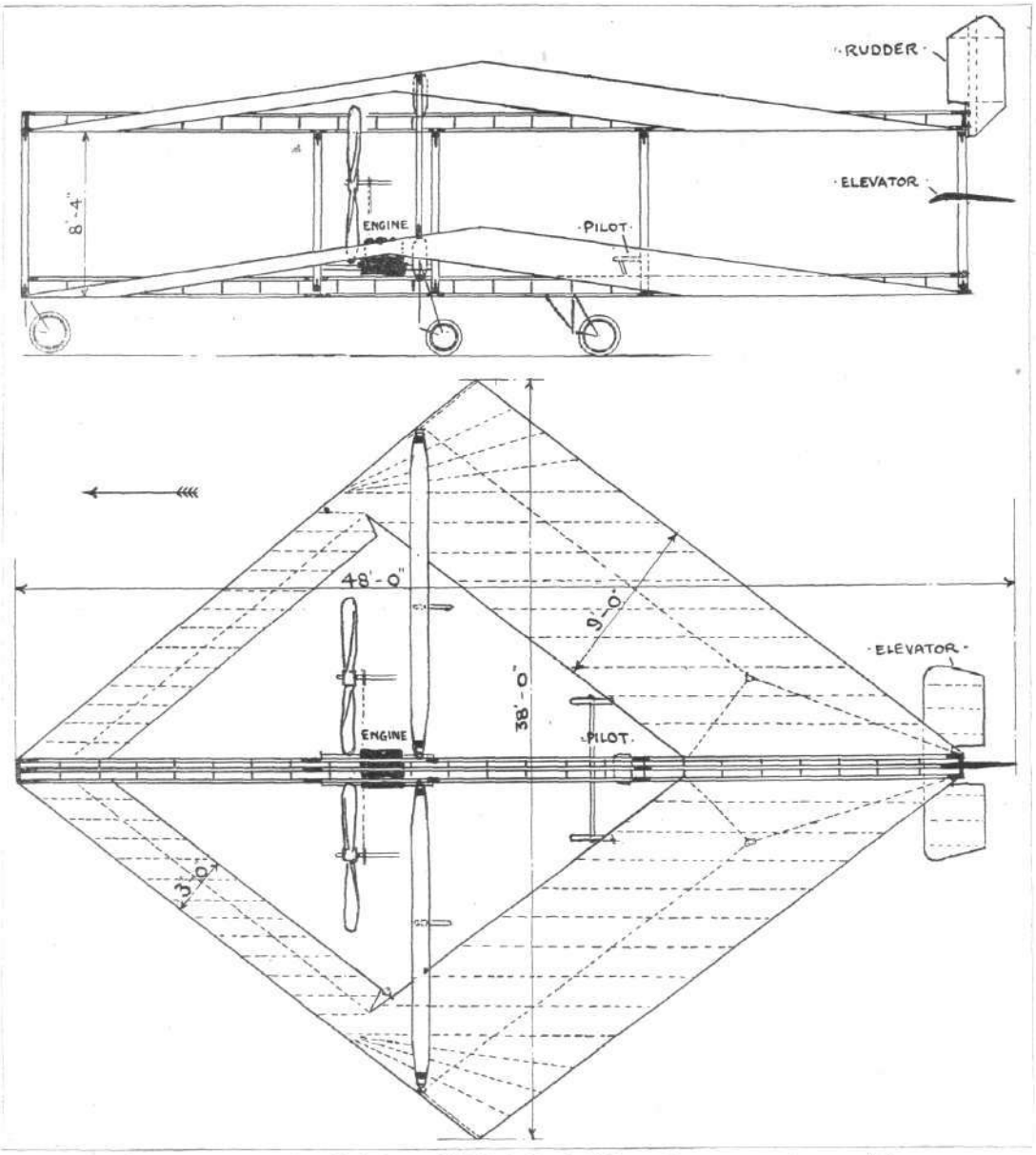
AN ORIGINAL ALL-BRITISH AEROPLANE.

PARTICULAR interest attaches to the machine concerning which we are now enabled to give comparatively full general particulars, inasmuch as it is not only novel to a very unusual extent as aeroplanes have heretofore gone, but is of British conception, British design, and British manufacture in its entirety. It is, in fact, one of the numerous machines upon which a great amount of work and thought have been bestowed during the past year or so in this country in a quiet and unobtrusive manner, which cannot fail before long to assure for this country the position that it ought to take in aeronautic matters in the eyes of the civilised world. At the moment we are debarred from giving it a name, inasmuch as those associated with its development prefer to remain in the background until actual success has been achieved, or at any rate until the machine has been brought out to undergo its trials in the full light of day. At the present time it is receiving its finishing touches in readiness for an early test, and consequently the time is ripe when details of a broad character may be made public.

Apart from that we may only add that, as far as the preliminary arrangements of a commercial character are concerned, the enterprise has been backed by a large and very well known firm which is closely connected with the automobile industry. Our illustrations are amply sufficient for the immediate purpose that we have in view. The first of them gives a diagrammatic idea of the principle of construction as applied to a biplane, and is virtually a view of a small paper gliding model that can easily be made by anyone desirous of observing the upshot of that particular form of construction for an aeroplane. Similarly, briefly referring to the other illustrations, the third is reproduced from a photograph of a monoplane model with which numerous experiments were carried out during the initial stages, and with which some very remarkable results—which we ourselves had the pleasure of witnessing—were obtained. And then our large full-page scale drawings include a side elevation and a plan of the big biplane that is now nearing completion, while the two remaining sketches show the details of construction of the two principal members of this big machine.



Diagrammatic sketch indicating the principle of the hollow rhomboidal construction as applied to a biplane.

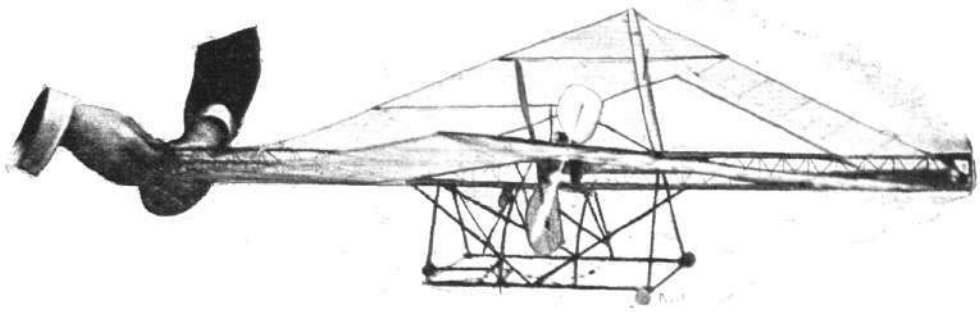


Side elevation and plan of the large all-British rhomboidal aeroplane now nearing completion.

Essentially the shape of the planes is rhomboidal, with a similarly rhomboidal opening that causes the two front surfaces to be considerably narrower than the two rear surfaces, as may be seen in several of the illustrations. The fore and aft axis lies diagonally across between the two more acute angles of the rhombus, and from either side of this axis the surfaces slope upwards slightly to give the familiar dihedral angle form of construction, the advantages of which most of our readers already know. All that need be added on general principles is that the leading edges of the narrower front, and of the wider back planes are rendered rigid, while all trailing edges are not only made flexible but are given a normal downward trend; for these are the features upon which reliance is placed for giving unusual stability for the machine, and carrying the load centrally in such a way that its weight is equally distributed without any undue concentration of strain at any one place. We do not propose at the moment to go into the question of the why and wherefore for the automatic stability which is apparently obtained, but it will of course be observed that the large central aperture essentially tends that way,

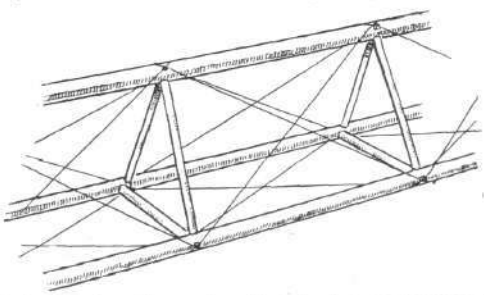
and that a compactness is obtained which differentiates the design from any other machines that are at all well known.

Passing direct to the large biplane that is now nearing completion, we may say at once that there are two very marked reasons why considerable interest is demanded by it. Firstly, there is, of course, this new principle on



View of the experimental monoplane with which numerous practical experiments were carried out before the large machine now building was commenced. This model, with its elastic motor, used to rise under its own power off its starting-rail, and travel a considerable distance in the air.

trial, affecting the form of the planes, but also, even apart from that, many of the constructional details that have been introduced are valuable contributions to the constructional development that is now going on all round. The inventor and designer has in this way displayed a degree of constructional skill which is far above the average in a first machine of this kind; and certainly haste to put his ideas to the practical test on a large scale has not been allowed to interfere with the thorough soundness of the job. The new biplane is ambitious in proportions, for it is intended to carry a very considerable

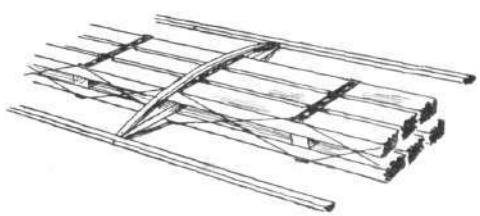


Details showing the wood and steel wire construction of the main girders.

weight, representing at least two or three persons, in addition to the comparatively heavy engine that is being installed. An extraordinary degree of strength has been secured with a remarkably low total weight, by the use of wood and of steel wire in a very special way. Thus has a net result been obtained of a total spread of about 1,200 square ft. of surface with a total weight of about 1,600 lbs., including 500 lbs. for the 50-h.p. engine.

As a backbone, two main girders are employed, one above the other, 8 ft. 4 ins. apart and some 45 ft. long. Each of them is triangular in shape, built as shown in our separate detailed sketch, some 1 ft. deep and built up of $1\frac{1}{4}$ in. diameter spars with short 1 in. struts and with diagonal wires that run spirally around them and are soldered where they pass over the screw heads that hold the struts to the spars. These long girders are, moreover, made in three separate lengths and are readily jointed together for erection; and the girders when in place are coupled up by five pairs of vertical tie-bars, disposed as shown in our drawing, and of a square cross-section chamfered off fore and aft to reduce their wind resistance.

Universally-jointed on either side of each of these girders is a transverse spar that slopes upwardly outwards and serves to carry the main planes by means of steel cables passing between its extremities and those of the girder to which it is attached. Each pair of transverse spars lies approximately on the level of each of the planes, and these spars are tied together by diagonals that render them comparatively rigid in spite of their ball-and-socket joints. Each spar is built up in the manner shown in our final sketch with six wooden members having a cross-section of $1\frac{3}{8}$ in. by $\frac{1}{2}$ in., with intermediate steel wire diagonals soldered to steel straps. Special wire strainers are used



Internal wood and steel wire construction of the transverse spars.

during the process of construction of this central portion, and an immensely strong member results. Finally, the completed spar, as illustrated in our sketch, is covered with fabric, and then its cross-section,, which is oval in shape, is approximately 1 ft. in width by $2\frac{3}{4}$ in. maximum depth. As will be observed from the plan, moreover, these spars are about 16 ft. in length.

The planes themselves are of fabric and are carried by steel cables stretched between the ends of the girders and the ends of the spars as already mentioned. The fabric forms a single surface upon bent wood ribs that lie longitudinally through it and are pocketed against it, these ribs tapering off rearwardly and thus giving the

desired flexibility to the trailing edge that projects behind the stretched cable. For the front planes, the ribs lie about 1 ft. apart, while at the rear they are situated about 18 ins. apart. The camber of the planes is in the neighbourhood of 4 ins.

Our scale drawings show the position of the engine and of the two 8 ft. wood propellers that lie about 9 ft. 6 ins. apart and almost centrally between the planes. As will be observed, the engine lies just forward of the spars, where it rests on a channel steel frame, and is therefore right in front of the pilot's seat and of the seats which may be provided for passengers. A framing of steel tube is employed for carrying the propellers, which are driven by a pair of chains, one of which is crossed, and are geared in the ratio of about 3 to 1, giving a normal speed of some 600 revs. per min.

Concerning the control, the exact position of the rudder or rudders is not fully determined, provision having been made whereby it can either be fixed at the back as seen in our drawings, or in front immediately behind the fore pair of uprights. It and the elevator form the sole means of control, and both are to be operated by a single universally jointed lever. The idea is to move this lever in one direction for elevating and in the other direction for lateral steering. Finally it will be observed that the machine is provided with five supporting wheels, all of which are spring suspended; and with this we may leave the subject of an unusually interesting machine for the moment, until the next stage in development has been completed. Needless to say, everybody in this country, at any rate, will wish its inventor the success which he deserves, if only because of his originality and obvious inventive ability.

FRENCH GOVERNING BODIES.

THE MEANINGLESSNESS OF "SPORT" IN FRANCE.

By Geo. N. Barnes.

THE recent action of the International Aeronautical Féderation and the Commission Aérienne Mixte came possibly with less surprise to me than the majority of your readers. Up till quite recently I spent a considerable amount of my time in the French capital, and had on several occasions reasons to have dealings with French federations, and the result of my meetings with them has convinced me that fair play from them is the last thing in the world one is likely to get, if English, and little doubt exists in my mind that the Aero Club would be well advised to cut aloof from them altogether until they are prepared to meet them on absolute equal terms in every particular.

To my way of thinking, England holds far too much respect for the word "sport." Sport, we know by our national instinct, is one of the obvious characteristics of an Englishman in whichever part of the world he is found, but in our extreme regard for the word the business aspect of matters gets somewhat obscured, and after all is said and done the pure financial side of the whole question is the one thing that interests the French, whatever outward appearances they may endeavour to show to the contrary.

When one is dealing with a body such as this it naturally follows that to meet them in our natural sporting spirit is abject folly, and it is a position absolutely untenable to give way to them and continually whelp from their repeated lashings. Far better is it to play them at their own game, and refuse to allow their aviators to compete at our meetings until equality in either country reigns supreme. The case of the flyers who were suspended at the Doncaster meeting is one that particularly struck me, as I had a somewhat similar case two or three years ago. I firmly believe that had not the Aero Club reduced the suspension of the French aviators who competed, on the receipt of their sagacious appeal, the French Federation would immediately have given an example of the attitude they intend maintaining. I remember once signing a contract with Guippone, the famous motor cycle and car driver, who is now entering the list of aviators, to compete in some motor cycle races at Turin. At the time in Italy there existed a dispute between two governing bodies, and the races in which we competed were run under the auspices of the body not affiliated to the International Federation. The result was Guippone and I were immediately suspended and fined. The Italian body interceded on behalf of Guippone in the same way as the French body interceded on behalf of their aviators, and Guippone was pardoned. I therefore asked my Union in England—namely, the Auto-Cycle Union—to appeal on my behalf, but the result was I had to suffer, although we had both committed the same offence. This, I think, clearly shows the attitude of the French Unions towards the English, and actions like these have led me to conclude that it is no good looking to France for sportsmanship.

From personal knowledge of several machines that are under construction in England, unless all of these are followed by extreme ill-luck, we shall have, by the opening of the season proper, a sufficient number of English aviators capable of assuring the success of any meeting promoted within the limit of our shores, and I believe that from a financial side of the case—which must not be overlooked, for this year, at any rate—England will be as happy a hunting ground as anywhere, and so make the foreigner regard us with envious eyes.

Therefore, I submit it to the Aero Club that it is questionable as to whether it would not be even advantageous to the English industry to be aloof altogether from the International body. Whilst the Continental crowd who have obtained a large start from us (there is no denying this) are barred from our meetings the prizes that are being in this way reserved for Englishmen would encourage the home manufacturers, and give them a chance to pick up lost ground. The closing of the majority of events to foreign machines would also help the home manufacturer to recover his position. It is as much the duty of the Aero Club to foster the industry as well as look after the sport, and I suggest the opinion that these matters are worthy of consideration on that score alone, especially as we have not "protection" to aid us in any way. To my mind the International Federation has done this country all the good it is likely to do, it has established firmly the position of the Aero Club as the sole governing body of the sport and guardian of the industry, and from the way in which the English interests were looked after at the International meeting, I do not think we are in bad hands.

FLIGHT

AERIAL PROPELLERS.

BY A NAVAL CONSTRUCTOR.

CHAPTER I.—The Screw Propeller.

THE screw propeller, in some form or other, has been in use for several centuries. It is stated that the Chinese used this method for propelling ships at a very early date.

It was not, however, till the beginning of the nineteenth century that the screw propeller became of any practical importance in Europe.

In 1836, Smith, an Englishman, and Ericsson, a Swede, applied it successfully to the propulsion of ships.

Since then the screw propeller has been used a great deal for the propelling of vessels at sea.

The screw propeller, working in water, has been the subject of many theories. Such eminent men as Rankine Greenhill and W. Froude have studied it from the point of view of hydrodynamics, but the results of their labours in this direction have been of little practical value. The complex actions taking place in the water acted upon by a screw propeller do not, with our present knowledge of hydrodynamics, admit of a mathematical analysis.

Recourse, therefore, has to be made to experiments on models.

The results of these experiments, carried out under practical conditions, together with quite justifiable mathematical assumptions, have made the solution of the screw propeller problem a quite definite, although by no means easy, one.

Experiments on screw propulsion in water have been made by W. Froude and R. E. Froude in England, and Durand and Taylor in America.

This part of the subject, therefore, has been exhaustively treated, and little can be done in this direction as regards the action of the propeller in water.

In the absence of data obtained by experimenting with propellers in air, we must look to the water-propeller for a solution of the air-propeller problem.

We shall see, in a later chapter, that the two bear a perfectly definite relation to one another.

In this way we can utilise the results of experiments carried out in water, for the purpose of designing propellers to work in air. The scientific design of an aeroplane propeller can, therefore, be carried out.

We shall be able to find out the propeller best suited to our requirements. We shall know exactly the horse-power required, and the efficiency we are getting if we carefully study the curves given in a later chapter.

CHAPTER II.—Definitions.

It must be clearly understood that we are dealing with propellers of uniform pitch in the following pages.

On many aeroplanes this is not the case, the propeller very often consisting of two inclined flat boards placed radially on the propeller-shaft.

Any change from the true screw surface can only result in loss of efficiency. The method of designing the screw surface will be given in the last chapter.

The following definitions are very important, and should be clearly understood.

1. **Pitch.**—The pitch of a propeller is the distance the propeller would advance for one revolution of the propeller-shaft, if the whole was working in a solid substance which was incompressible and unyielding. As an instance of this we may take the case of a nut working on a screw thread. For one revolution of the nut it will advance a distance equal to that between two threads.

The screw-propeller working in a solid substance can be taken as a nut working on a bolt whose threads have a relatively long pitch. The pitch is usually denoted by p.

2. **Slip.**—In water and air, however, we have the liquid or gas yielding to the force of the propeller-blade, and in consequence of this the propeller does not advance a distance, p, but a smaller distance.

Suppose now it advances a distance, x, per revolution of the shaft.

Now the amount x fall short of p divided by p is termed the slip of the propeller. This is usually denoted by s.

Putting this in symbols we should have $s = \frac{p - x}{p}$

Sometimes this is expressed as a percentage, and is then called the "slip per cent.," thus $s = \frac{p - x}{p} \times 100$.

The slip varies considerably in any given propeller, according to the conditions under which it is working.

When it is working on the shaft of a motor fixed to a bench it obviously does not advance at all, and in this case the slip is 1 or 100 per cent.

Obviously this does not represent working conditions.

It does not follow, by any means, that a propeller giving a good thrust by a bench test will be an efficient one to fit in a moving body such as an aeroplane. Such tests as these are of little or no value.

To calculate the slip in any given instance we may take the following example.

Suppose we have a propeller of pitch 4 ft. working on an aeroplane travelling, relative to still air, at the rate of 60 ft. per second (about 41 m.p.h.). Suppose the revolutions of the propeller-shaft are 20 per second (1,200 r.p.m.).

Now the actual distance the propeller moves forward in one revolution is $\frac{60}{20}$ ft. = 3 ft.

But pitch is 4 ft. Hence slip is $\frac{4 - 3}{4} = .25$ or 25 per cent.

A large amount of slip does not necessarily mean loss of power or efficiency, but we should in no case work with a larger slip than 40 per cent. If we go above this the efficiency begins to fall off very rapidly.

3. **Pitch Ratio.**—This is the ratio of the pitch of the propeller to the diameter of the circle described by the tip of the blades. It is usually denoted by P. Thus $P = \frac{p}{D}$

Where D is the diameter of the propeller.

That is, a propeller having a pitch of 4 ft. and a diameter of 5 ft. has a pitch ratio of $\frac{4}{5}$ or .8.

In actual practice the pitch ratio ranges between .4 and 1.2. Between these limits the higher the pitch ratio the better the efficiency.

The pitch ratio, however, is largely dependent on the conditions under which we are working in our design, and it may be impossible to fit a propeller having a high pitch ratio.

Disc Area Ratio.—The area of the blade of the propeller is usually expressed as a fraction of the area of the circle described by the tip of the blade of the propeller.

The ratio of the developed area of *one* of the blades of a propeller (whether two, three or four bladed) to the area of the circle described by the tip of the blade we shall call the "disc area ratio."

For each pitch ratio there is a certain value of the "disc area ratio" which gives the best efficiency together with

a good thrust. The effect of varying the "disc area ratio" for any given propeller varies considerably according to the pitch ratio which we are using. Thus at the lower pitch ratio the result of increasing the area of the blade would be to cause less thrust and efficiency.

That is, for a low pitch ratio a narrow blade actually develops more "total thrust" than a wide one, besides being more efficient. This seems at first very improbable, but is an experimental fact.

At the higher pitch ratios, however, by increasing the blade area, we do increase the thrust whilst the efficiency varies in a very curious manner.

The rate of increase of the thrust is, however, small compared to the rate of increase of the blade area.

Thus a *slight* alteration in the blade area would not materially alter the thrust developed by the propeller.

In the following pages we shall use three different types of blades, and we shall call them (*a*), (*b*) and (*c*). Thus :—

No. of blade	...	*a*	...	*b*	... *c*
Disc area ratio	...	·04	...	·07	... ·11

In any given case it may be possible to obtain a slightly better propeller by increasing or diminishing the area of one of the above standard blades, but the gain would be so small as to be practically negligible.

As regards the shape of the blade when developed it is found that a rectangular shaped blade with the corners rounded off, gives as good a result as any, and practically cannot be improved upon.

A New French Aerodrome.

A NEW aerodrome has been constructed at Crau, quite close by Marseilles, the feature of which will be that the course will be 3·333 kiloms. round, so that it will be easy to time competitors over long distances.

Sports Exhibition at Frankfort.

AN International exhibition of sports and games is being organised to be held in Frankfort, May 15th to July 15th next. It will consist of two main sections, (I) objects connected with various sports, and (II) performances and exhibitions by well-known exponents of the most popular games and pastimes. Naturally, of the thirteen groups one will be devoted to motoring, while another will be illustrative of aviation. Full particulars can be obtained from Sport Ausstellung, 1 Taunus Strasse, Frankfort-on-Main.

Transporting an Aeroplane Through London.

A CORRESPONDENT sends us particulars of the transport of a Blériot monoplane through London on its own wheels on Wednesday of last week. The work was carried out by Mr. R. W. A. Brewer, general manager to Messrs. C. Grahame-White and Co., Ltd., the machine being one of their numerous monoplanes used for tuition purposes. This machine has been flying successfully at Hendon, and it was decided to transport it to the Company's works at Walham Green, where six monoplanes are in course of construction.

The wings were dismantled and attached to the sides of the frame. The machine left Hendon at 1.30 p.m., and was towed behind a motor car to Walham Green, where it arrived at 3.40 p.m. It will be remembered that the wheels of the Blériot machines are supported on long castors, and this proved to be a disadvantage in transporting, causing the machine to sway about in rather an alarming manner. In previous instances Mr. Brewer has always used fixed wheels—*i.e.*, in which no swivelling has been provided. This tends to keep the machine running on a straighter course.

We shall use all the above facts when we actually design the propeller, later.

It will be seen that the diameter, pitch ratio, disc area ratio, and the number of blades completely characterise any propeller. Given this information we are in a position to design our propeller.

Efficiency.—The efficiency of a propeller is the ratio of the useful horse-power (represented by the thrust of the propeller and its velocity forward) to the actual horse-power transmitted by the shaft, that is the brake horse-power of the motor. This will be much more clear if we take an example.

Suppose the thrust of a propeller when working on an aeroplane travelling at 60 ft. per second (about 41 miles per hour) is 200 lbs., and let the actual brake horse-power of the motor driving the propeller be 30 b.h.p.

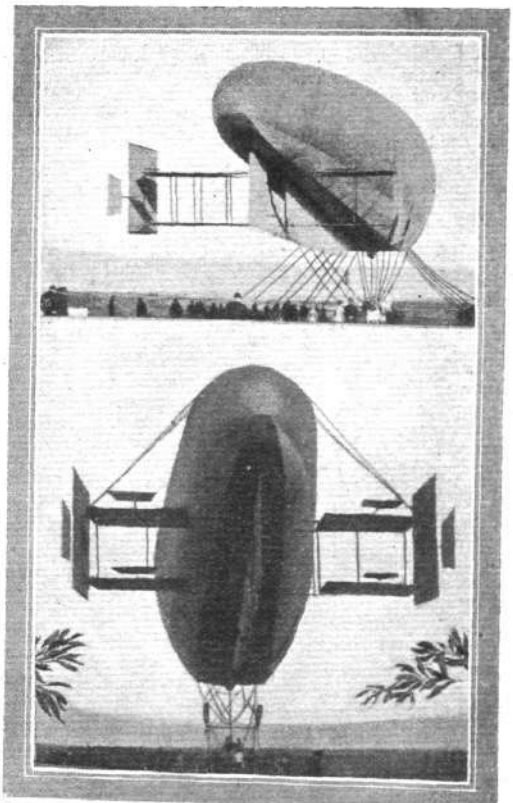
Now the useful work given out per second by the propeller is thrust × velocity in ft. per second = 200 × 60 = 12,000 ft. lbs. per second.

Now one horse-power is equivalent to doing work at the rate of 550 ft. lbs. per second or 33,000 ft. lbs. per minute.

Hence the useful horse-power is given by $\frac{12,000}{550} = 21{\cdot}8$.

Now the brake horse-power is 30, hence the efficiency $= \frac{21{\cdot}8}{30} = 73$ per cent.

(To be continued.)



"I bis," the Italian military airship, from two stern points of view, showing the planes more clearly than in previous photographs.

The Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

Annual General Meeting.

The Annual General Meeting of the members of the Aero Club of the United Kingdom will be held on Thursday, March 10th, 1910, at 5 o'clock, at 116, Piccadilly, London, W.

Notices of Motion for the Annual General Meeting must be received by the Secretary not less than twenty-one days before the meeting, and must be signed by at least five members. Wednesday, February 16th, is the last day for the receipt of Notices of Motion.

Committee.

In accordance with the rules, the Committee shall consist of eighteen members. Members are elected to serve for two years, half the Committee retiring annually. Retiring members are eligible for re-election.

The retiring members of the Committee are :—

Ernest C. Bucknall.	Earl of Hardwicke.
Vice-Admiral Sir Charles Campbell, K.C.M.G., C.B., D.S.O.	V. Ker-Seymer.
	J. T. C. Moore-Brabazon.
	Hon. C. S. Rolls.
Col. J. E. Capper, C.B., R.E.	Roger W. Wallace, K.C.
Martin Dale.	

Any two members of the Club can nominate a member to serve on the Committee, having previously obtained such member's consent. The name of such member so nominated, with the names of his proposer and seconder, must be sent to the Secretaries in writing not less than fourteen days before the annual general meeting. Wednesday, February 23rd, is the last day for the receipt of nominations.

Members are reminded that a ballot paper for the election of nine candidates to seats on the Committee of the Club will be forwarded to them at least seven days before the date of the annual general meeting.

No ballot paper which is signed, or on which the number of candidates voted for is more or less than the number of vacancies, or which is received by the Secretaries later than 12 noon on Wednesday, March 9th, 1910, will be valid.

Committee Meeting.

A meeting of the Committee was held on Tuesday, the 1st inst., when there were present :—Mr. Roger W. Wallace, K.C., in the chair, Mr. Ernest C. Bucknall, Vice-Admiral Sir Charles Campbell, K.C.M.G., C.B., D.S.O., Mr. Martin Dale, Mr. John Dunville, Professor A. K. Huntington, Mr. V. Ker-Seymer, Mr. C. F. Pollock, Hon. C. S. Rolls, Mr. J. Lyons Sampson, Mr. Stanley Spooner, and joint secretaries Capt. E. Claremont, R.N., and Harold E. Perrin.

Aero Exhibition.

The Aero Exhibition will be held at Olympia from the 11th to the 19th March, 1910.

Members wishing to exhibit full-sized machines are requested to communicate at once with the Aero Club.

A special section will be set apart for models, and full particulars can be obtained from the Aero Club.

Library.

The following books have been presented to the library by :—
A. S. E. Ackermann, B.Sc., "Popular Fallacies."
Major B. Baden-Powell, "Practical Aerodynamics."

Accident to Mr. A. Mortimer Singer.

Mr. A. Mortimer Singer, who went to Cairo as a representative of the Club to compete in the aviation meeting at Heliopolis, met with an accident while practising on Tuesday last. The first news was of a very serious nature. The Committee immediately sent a cablegram expressing their extreme regret, and asking for further news. An answer has since been received from Mrs. Singer stating that Mr. Singer broke the bone of his right thigh and has injured his back, but to what extent the telegram does not say. The Committee feel sure that all Members of the Club will join them in expressing their sympathy to Mr. and Mrs. Singer at this very sad occurrence, which is not only a blow to the hopes of the Club at Heliopolis, but also a serious loss to England, whose honour he was going to sustain against all the well-known foreign aviators.

Mr. Singer is such a good sportsman and kind friend that we feel sure universal regret will be expressed. The Members of the Club and all lovers of aviation will wish him a speedy and thorough recovery.

E. CLAREMONT, CAPT. R.N.,
HAROLD E. PERRIN,
Joint Secretaries.

166, Piccadilly.

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PROGRESS OF FLIGHT ABOUT THE COUNTRY.

(NOTE.—Addresses, temporary or permanent, follow in each case the names of the clubs, where communications of our readers can be addressed direct to the Secretary. We would ask Club Secretaries in future to see that the notes regarding their Clubs reach the Editor of FLIGHT, 44, St. Martin's Lane, London, W.C., by 12 noon on Wednesday at latest.)

Manchester Aero Club (9, ALBERT SQUARE, MANCHESTER).

THE Model Exhibition arranged for February 4th and 5th has been postponed till March 4th and 5th, as the committee find that it is impossible to get all arrangements through in time.

Mr. Leigh having resigned his position as secretary to the Model Show Sub-Committee, Mr. Stafford Threlfall has taken over the work, and all communications should be addressed to him.

The committee are hard at work, and assure all model makers that the show will be a success, and that those entering models will be satisfied both with the organisation of the show and also with the prize list. Further particulars will be issued later.

Oldham Aero Club (5, CHURCH TERRACE, OLDHAM).

THE inaugural meeting of the above club was held on January 27th, Mr. Dean presiding. The chairman in his opening remarks said the objects of the club were to encourage and help inventors to bring forward any ideas which they may have ; he also referred to the rapid development of aviation.

Mr. G. St. John Day was elected a President, and promised his utmost support to the club, and also gave an interesting address which aroused much enthusiasm. Mr. Wm. Brown, Mr. J. Lees and Mr. G. A. Worthington were elected Vice-Presidents.

Mr. Wm. Brown has made a generous donation to the club to be devoted to prizes for the Model Flying Competition which is to be held in the near future.

On January 31st the club held a social, which resulted in several members being enrolled.

Sheffield and District Aero Club (36, COLVER ROAD).

SOME difficulty is being experienced in obtaining suitable works premises, but the committee are still continuing inquiries. Regarding the year's programme, the latest development is in connection with the Sheffield Charity Tournament on Whit Monday at Bramall Lane grounds, an annual carnival usually attended by 25,000 to 30,000 persons, at which the committee are arranging for Model "Flying" Competitions, &c., to take place. Only a large entry is needed to make the scheme a splendid success. Further particulars will be announced later.

S.W. Aeronautical Soc. (51, ST. LEONARD'S ROAD, EAST SHEEN).

A WELL-ATTENDED general meeting was held on the 30th ult. at the Ship Hotel, Hammersmith, at 6 o'clock. The monoplane fund was raised to eleven guineas, Mr. H. A. Ward contributing a guinea. Mr. Richards, of Croydon, has kindly offered to supply the petrol tanks. All substantial helpers' names will be engraved on an aluminium plate on this the club's first monoplane.

In addition to the prize offered by Mr. Fransella, Mr. Furby Smith and Mr. Warsop will also offer prizes in the Model Competition, and certificates will also be granted by the Society.

Entries should be sent as early as possible to the secretary.

AVIATION NEWS OF THE WEEK.

More Flying at Eastchurch.

Two flyers were in the air, simultaneously, for the first time at the Aero Club's grounds at Eastchurch on Monday last, when the Hon. C. S. Rolls was aloft on his Short-Wright biplane and Mr. Grace on a Voisin. Mr. Rolls also carried a passenger for some miles during one flight. On Thursday of last week Mr. Rolls made two flights, one of twenty minutes duration, while Mr. Grace, who was also out, after making a good flight slightly damaged the wheels of his machine on landing, probably owing to the frozen state of the ground.

Flyers and Politics.

ALTHOUGH aeroplanes are hardly likely to be pressed into use for the purpose of taking electors to the poll just yet, it is at least interesting to note that last week Mr. Moore-Brabazon decorated his machine with several posters advocating the claims of the Unionist candidate for North Kent, and one just caught a glimpse of what might happen at the next General Election.

A Monoplane at Edinburgh.

MR. WILFRID FOULIS, the well-known Edinburgh motorist, has had the "Lane" monoplane, with which he has been experimenting at Brooklands, taken to Edinburgh, and he hopes to shortly resume his trials in the neighbourhood of the Scottish capital. In general appearance the monoplane is similar to the "Blériot No. XI" type. It is fitted with a 4-cyl. 30 h.p. N.E.C. motor of the 2-cycle type.

Flying Meetings in Great Britain.

OF the two dates allotted by the Federation Aeronautique Internationale to Great Britain, the first—July 11th to 16th—has been secured by Bournemouth, who will organise a flying meeting in connection with the Centenary celebrations this year. The second date—August 6th to 11th—has not yet been definitely decided, but in several directions applicants are hoping to be the fortunate allottees.

In addition to these fixtures, which will be international in character, there is every probability of several other national meetings being organised. Both Edinburgh and Wolverhampton are desirous of having such meetings.

The Heliopolis Meeting.

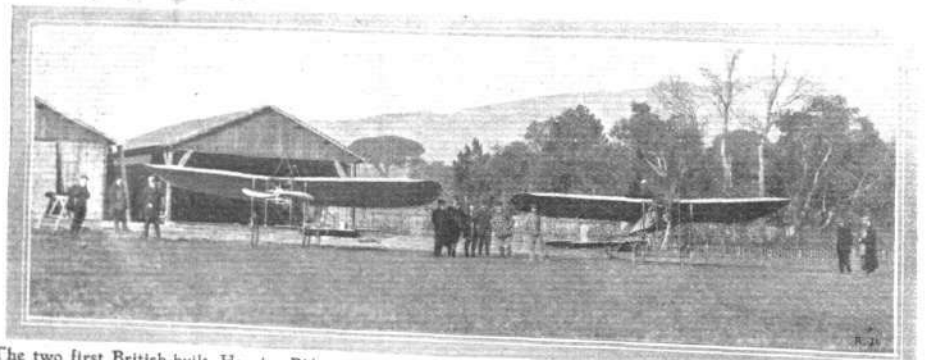
OF the fourteen entrants for the flying meeting at Cairo, which opens to-morrow (Sunday), and is to continue till the following Sunday, only one, Count Lambert, declared forfeit. The other thirteen are:—Latham (Antoinette), Rougier (Voisin), Balsan (Blériot), Le Blon (Humber-Blériot), Gobron (Gobron), Duray (Farman), Mortimer Singer (Farman), Grade (Grade), Michelin (Antoinette), Metrot (Voisin), Riemsdyck (Curtiss), Guyot (Blériot), Mme. de la Roche (Voisin). During the past week a good deal of practising has been going on, and on Tuesday Mr. Mortimer Singer met with an unfortunate accident, to which further reference is made in the Aero Club notices on p. 93. Mr. Singer's injuries are of such a character that there is little doubt he will not be able to take any active part in the meeting. On Thursday of last week, too, Mr. Latham had a mishap, his machine for some unaccountable reason making a sudden descent from a height of about 50 metres. The machine was badly damaged, but fortunately the aviator escaped unhurt. Rougier made several good short flights last week-end.

The Floods in Paris.

BOTH the motor and flying industries have been hard hit by the recent floods in Paris and the neighbourhood, and work both at the Voisin factory at Billancourt and the Gnome factory has had to be suspended, as also at the Bayard-Clement, De Dion, Renault, Darracq, Unic, and Charron motor car works. The Voisin works at Issy have also been inundated, while the Kaufmann, Santos-Dumont, Nieuport, Vendome, Witzig, and M. Clement are under water in their respective hangars there, and will require a good deal of cleaning and tuning up before being fit to fly again. Our French contemporary, *L'Auto*, has opened a subscription for those motor employés who are suffering by the floods, and the A.C.F. and MM. Panhard-Levassor have each subscribed 10,000 francs.

Passenger Records.

THE last day of January was noteworthy, for it produced remarkable performances at Chalons on the part of the two Henry Farman pupils, Van den Born and Efimoff, both easily surpassing the world's passenger record standing to the credit of Orville Wright, namely 1h. 9m. 45⅗s. Although the temperature was six degrees below freezing point, Van den Born went up with a passenger at 3.18, and continued flying for 1h. 48m. 50s., during which he covered 151 kiloms.,



The two first British-built Humber-Blériot monoplanes at Cannes, where Mr. Ballin Hinde took them with the intention of proceeding on to the Heliopolis Aviation Meeting opening next week.

while Efimoff, who rose with his passenger about ten minutes later, flew for 1h. 48m. 30s., covering 158 kiloms. in that time. The Henry Farman machine thus holds the world's records for duration and distance, with or without passenger, and the height record.

Maurice Farman in a Fog.

ON Monday last, Mr. Maurice Farman attempted to fly back from Orleans to Chartres, but after he had been going for about twenty-five minutes and was over the plains of Beauce, he ran into a bank of dense fog, rendering it impossible to see more than a few feet ahead. He therefore decided to land, and came down at Allaines, about 38 kiloms. from Chartres, where he was able to leave his aeroplane at a farm.

Practice at Chalons.

LIEUT. CAMERMAN, who is one of the military officers appointed to be instructed on the Henry Farman machine, had his first lesson on the 28th ult., and flew for a kilom. at a height of ten metres. The other Government military pupil, Captain Moron, has not yet commenced his lessons. M. Efimoff, on the 26th ult., flew for 53 mins., during which he traversed about 55 kiloms., rising sometimes to a height of very nearly 150 metres. On the same day, Kinet, who purchased Sommer's old Henry Farman machine, made two flights, one of six and the other of ten minutes' duration, while on the following day he flew during 15 mins.

Sommer Flies Over the Flood Waters.

ON January 31st M. Sommer flew for twenty minutes on his new biplane at Mouzon, and during most of this time he was flying over the flood water, which has spread entirely over the plain by his works, due to the overflowing of the river Meuse. Sommer was also out for ten minutes on the 26th ult., but the intense cold caused him to bring his trial prematurely to an end.

Doings at Pau.

THERE is now an Antoinette school at Pau, as Kuller, who has succeeded Latham as the tutor for these monoplanes, has arrived with three pupils, Messrs. Mumm, Harkness and Johnson. These, as well as several new Voisin learners and the pupils at the Blériot school, make the scene at the Caubois aerodrome a busy one.

The dirigible "Espana" has been inflated and her trials by the Spanish military authorities will shortly be resumed.

Molon at Havre.

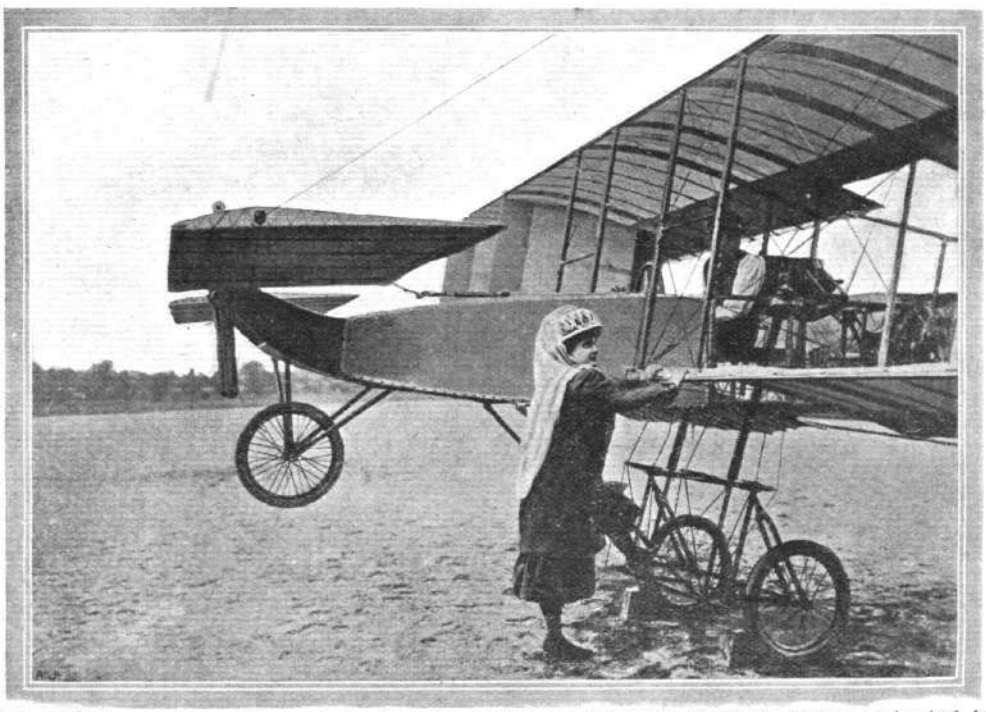
DURING last week Molon made several short flights on his Blériot monoplane at Havre, the longest being of about 25 minutes' duration.

German Military Aeroplane.

AT the end of last week the German military aeroplane, known as the Hoffmann, and somewhat similar in arrangement to the Wright biplane, was given its first trials at the Templehof grounds but no free flight was obtained. The machine is designed to be launched from a little carriage running on a single rail, and after three trials the aeroplane was derailed and the chassis sustained damage.

Cagno and Bianchi at Cameri.

CAGNO AND BIANCHI have decided to make Cameri, a new aerodrome about 12 kiloms. from Novare, their



Madame Paulhan, in her aviation costume, about to mount on to her husband's Voisin biplane, with which he was flying at Issy last year. This is a very good sample of one of the many "faked" aviation photographs so prevalent in France.

flying headquarters, both of them having decided to give up motor racing in favour of aviation. Bianchi has already made several short flights on Cagno's old biplane, which was at Brescia, while Cagno himself expects to receive delivery shortly of a new Voisin.

91 Metres too High for Paulhan.

IT is interesting to read in a cable from America that during a flight at Salt Lake City, on January 31st, M. Paulhan was obliged to descend as he found he could not breathe at an altitude of only 300 ft. It is explained, however, that Salt Lake City stands more than 12,000 ft. above sea level.

Lebaudy to Build Monoplanes.

UP to the present the works of the Lebaudy Brothers at Moissons have been exclusively occupied with the construction of dirigibles, but it is now announced that a new department for aviation is to be started. This will devote itself to building a monoplane which has been designed by M. Henri Julliot.

Monaco to Cap Martin and Back.

IT is reported from Monte Carlo that Rougier has undertaken to fly from Monaco to Cap Martin and back some time during the Monaco Motor Boat Meeting next April.

German Emperor and Aeroplane Models.

H.I.M. THE KAISER has ordered that scale models of the Latham, Blériot and Wright aeroplanes and of the Lilienthal glider are to be placed in the Berlin Museum of Arms, together with models of the various dirigibles.

Euler Aeroplanes at Frankfort.

THE Frankfort Flying Club have decided to purchase a Euler aeroplane for the use of the members, and the necessary funds have been subscribed by the founders of the club. After making a flight of a kilometre at a height of 6 metres, Herr von Gorrisen has also decided to purchase one of these machines.

Flight Meetings at Munich.

AN academy of aviation has been formed at Munich, and has under consideration the question of organising two flying meetings on the plain close by Puckhein railway station. The first is proposed for June 5th–12th, and the second for September 4th–11th. The Academy is also starting a school for the instruction of both civil and military flyers.

Budapest Flying Meeting.

THE Aviation Section of the A.C. of Hungary is working hard to ensure the success of the flying week which it is proposed to hold at Budapest from June 19th–30th. Twelve competitions are being arranged, including those for speed, distance, duration, height, &c., and the prizes will vary from £200 to £4,000. Altogether about £24,000 will, it is hoped, be distributed as prizes.

Charts for Flyers.

At the last meeting of the Touring Committee of the A.C. of France, it was decided to commence the preparation of a series of charts for flyers, giving the distance, "as the crow flies," between the most important towns in France, and indicating by some graphic means the usual set of the wind above each town. The two first charts will refer to the environs of Paris and of Rheims.

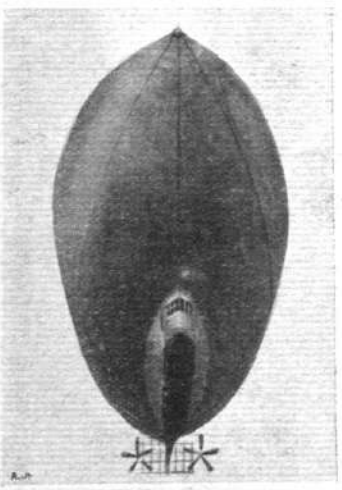
Sunday Kite Flying Prohibited at Willesden.

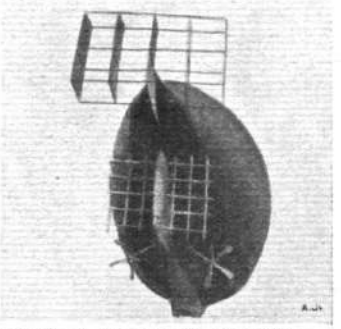
THE Willesden local authorities recently framed a bye-law prohibiting the flying of kites and model aeroplanes in the public parks on Sundays, and they have requested the Local Government Board to confirm their action.

AIRSHIP AND BALLOON NEWS.

British Naval Dirigible.

ALTHOUGH it appears that it will be a month or two before the British naval dirigible will be ready for launching, one or two items regarding her may be of interest. Although the vessel will be very little smaller than the latest Zeppelin, she will probably be used mainly for scouting purposes, and it is expected that her 200-h.p. engines will give her a speed of 40 miles an hour. She will be fitted with wireless telegraphy apparatus to enable her to communicate with vessels and the naval bases.





Two views of the Italian Airship, "Leonardo da Vinci."—On the left is seen the bows, and on the right the stern, with its rudder, elevating planes, and two five-bladed propellers.

An Aerial 'Bus for Pau.

OF the two latest dirigibles to be turned out by the Astra factory, one—the "Ville de Pau"—is intended to make excursions in the neighbourhood of that city. The airship is to carry eight passengers besides the crew, and 200 francs has been mentioned as the fare to be charged for trips of short duration. The airship will shortly undergo trials with the "Ville de Bruxelles" at Issy.

Fatal Accident with "Zodiac III."

WHILE Count de la Vaulx's dirigible was being deflated at St. Cyr on Friday of last week, by some means the gas was displaced and caused the balloon to swell out and break part of its shed, which fell upon and killed a mechanic named Le Gal who was assisting in the work of deflation.

More German Airship Manœuvres.

IT is reported from Berlin that the German Government will not purchase any more dirigibles for some time, until, in fact, it is seen which direction the development of aeroplanes will take. Next month those airships which the German Army have at present will take part in a series of manœuvres from Metz, as headquarters, instead of Cologne, as on the occasion of the last series of operations with dirigibles.

Zeppelin Polar Expedition.

PROFESSOR HERGESELL is making a good deal of progress in connection with the organisation of the Zeppelin expedition to the North Pole. At present the project calls for the construction of two dirigibles 150 m. long, with 25 to 30 separate compartments, and capable of carrying 25 persons, although during the actual Polar journey only 12 persons would be carried. The base of the expedition would be at Spitzbergen, and it is estimated that the trip to the Pole could be accomplished in 30 to 40 hours if the winds were favourable. While the first vessel will make the attempt to fly to the Pole, the other one will remain at Spitzbergen and keep in touch with it by means of wireless telegraphy. The cost of the expedition will probably be supported by the German Government, but it is also stated that the Prince of Monaco will take part and contribute £160,000 towards the cost.

A Municipal Airship Garage.

WITH a view to assisting the company which has been formed to run aerial excursions in the neighbourhood of Munich, the municipal authorities there have just voted 60,000 marks towards the cost of providing an airship garage large enough to house a Zeppelin, if necessary. The airship for the passenger service will probably be a new Parseval, which is now under construction.

French Balloon Meetings.

FIVE events for spherical balloons are to be organised during this year, and their dates have been fixed as follows: March 26th, distance competition; May 29th, landing competition; June 19th, Grand Prix; September 17th, distance event; October 23rd, landing contest.

Gordon-Bennett Balloon Race.

A CONFERENCE of American Aero Clubs was held at St. Louis on Saturday last to consider the question of venues for the competitions for the Gordon-Bennett Cups this year. Kansas City, Indianapolis, Philadelphia, Baltimore and Washington all wished to have the honour of having a flying meeting with the Gordon-Bennett Flight Cup as its chief event, and the final choice will probably not be made for a month. Mr. Cortlandt F. Bishop, President of the American Aero Club, has, however, stated that St. Louis will be the starting place of the Gordon-Bennett Balloon Race.

Records of Wind Velocity.

BY the courtesy of Dr. Shaw, Director of the Meteorological Office, the Advisory Committee on Aeronautics have been able to make arrangements by which a selection of current autograph records of wind velocity from the twenty-three anemograph stations will be on exhibition, together with other records, at the Meteorological Office, 63, Victoria Street, Westminster, from 10 a.m. to 4 p.m. daily, except Saturdays, when the office closes at 1 p.m. To enable visitors to better understand the results arrived at, a number of models have been constructed.

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CORRESPONDENCE.

*** *The name and address of the writer (not necessarily for publication)* MUST *in all cases accompany letters intended for insertion, or containing queries.*

Correspondents asking questions relating to articles which they have read in FLIGHT, would much facilitate our work of reference by kindly indicating the volume and page in their letters.

NOTE.—*Owing to the great mass of valuable and interesting correspondence which we receive, immediate publication is impossible, but each letter will appear practically in sequence and at the earliest possible moment.*

PROPELLER THRUST.

[331] Could you kindly answer through your correspondence columns the following question:—What is the maximum thrust that can be obtained from a propeller 6 ft. 6 in. in diameter; also at what speed will it drive a monoplane of 500 lbs. weight, and what will be the horse-power and revs. per min. required to drive the propeller?

San Francisco. EUGENE SPEYER.

[The thrust obtainable from a propeller depends so much on its design and the speed at which it is run that it is quite impossible to say what are the limits to a propeller 6 ft. in diameter.

If the weight of the monoplane mentioned above is exclusive of the pilot, it would hardly be advisable to try making experiments with less than a good 20-h.p. engine.

The proper sequence in design is to decide the type of machine desired, to estimate the weight, and from that deduce the probable thrust required for flight. The product of the thrust and the speed of flight determine the horse-power that will actually be utilised in flight, and an allowance of say as much again must be made for losses in transmission. Thus is the nominal h.p. of the engine required arrived at, whence the estimates for weights must be checked and the same sequence of calculations repeated, and so on until the error is slight according to the theoretical basis of the calculations adopted. Unfortunately, there is very little data available for these calculations, but various articles and information contained in back numbers of FLIGHT will be of assistance to those who wish to follow this line of investigation.—ED.]

AERO PORTS.

[332] Some weeks ago I noticed the proposal to make an aeroway from London to Brighton at enormons cost. Here is an alternative scheme that need not cost one tithe of that.

I suggest that fields and plots of land more or less in line from place to place, say, London to Brighton, be rented, or otherwise arranged for, as "ports" for alighting or starting. These might well be fitted up with one or more aero sheds, a petrol store, a "pylon," and a caretaker. A strip might be asphalted, but the main part could be turf, mowed or grazed.

These ports need not be in line, but close enough together to be within *gliding distance* from a moderate height. The use of these would be obvious. One could start from either place, choose a course more or less direct, fly high where ports were scarce, lower where desirable, keeping "under your lee," so to speak, one or more ports that could be reached if engine stopped, or anything else went wrong.

Comparatively small port dues would meet the case when planing is common. Landowners, parish councils, and other bodies might well use their land this way. It might soon become general when it "pays."

T. OSBORN SMITH.

PAPER GLIDERS.

[333] Being greatly interested in aviation, and having taken in your valuable paper for some months, I would be much obliged if you or any reader could inform me as to the record flight of a glider made from one sheet of notepaper. I have just made a bird-shaped one, weighted with sealing-wax at the front, which has flown 84 ft. on a gentle slope in a light breeze. This seems a fairly good distance for one of this size, as I only held it at arm's length above my head, and gave it a very small push. Hoping this will prove of some interest to your readers, I am,

Teignmouth. STURNUS.

MODEL DRAWINGS.

[334] Could you, or any of your readers, advise me where I could obtain the working drawings of a Wright aeroplane and a Blériot monoplane (models)?

Also the necessary materials for building same.

I should prefer models of about 4 ft. span to be driven by elastic motor. Trusting you will be able to oblige me, as I am a constant reader of your excellent paper, FLIGHT.

Canterbury. E. S.

FLYER EFFICIENCY.

[335] In your issue Vol. I, p. 804, you publish a very interesting letter by Mr. Evans on "The Analysis of Flyers," in connection with which I should like to make one or two remarks.

Mr. Evans considers the efficiency of a machine as (h.p. × sq. ft.) per lb., and obtains some very interesting figures by so doing; but I do not think we should consider the efficiency without taking the speed of the machine into account, and in connection with which I think the following table which I have worked out will be of interest:—

Name.	Area in sq. ft.	Weight in lbs.	h.p.	Speed. m.p.h.	Speed. Ft. per sec.	Where Attained.	Gross Weight of Machine only.	Weight of Machine, Pilot, and Fuel.	Efficiency.
Antoinette	365	1,210	50	42	61·8	Rheims, Aug., 1909	1,040	1,210	4·08
Blériot ...	150	715	25	45	66	English Channel, July 25th, 1909	484	715	12·58
Cody ...	780	2,200	80	43·8	62·7	Aldershot, cross-country	—	2,200	2·21
Curtiss ...	272	710	30	47	69	Rheims, Aug., 1909	550	710	6·00
Dumont ...	115	402	30	40	58·6	St. Cyr	242	402	6·81
Farman ...	420	1,382	50	37	54	Rheims, Aug., 1909	1,212	1,382	3·56
Voisin ...	445	1,150	50	31·5	46·2	Rheims, Aug., 1909	980	1,150	2·39
Wright ...	538	1,200	25	39	57	Rheims, 1909 (Tissandier)	1,030	1,200	5·10

These results have been based upon the following argument. The efficiency of a flying machine will vary directly as (1) the total weight supported, and (2) the speed of the machine; and inversely as (1) the area and (2) the h.p. So if—

η = the efficiency of machine
W = total weight in lbs.
S = speed in ft. per sec.
A = area in sq. ft.
h.p. = horse-power

Then— $$\eta = \frac{W \times S}{A \times h.p.}$$

This efficiency is not, of course, the actual dynamical efficiency of the machine, for this can only be obtained by knowing the exact gliding angle of the machine in still air; but it is a true efficiency of performance, and it shows whether the design is economical in power or not.

From the last column it will be seen that the Blériot comes out top by a long lead, which is just the same result as Mr. Evans got from his formula; whilst the next three are fairly close together, and form a very interesting group, as they consist of one monoplane and two biplanes; but as to why the Blériot should give this remarkable high figure I leave to future discussion.

Winchester. W. S. FLIGHT.

[These tables of efficiency that various correspondents have sent us are extremely interesting, and contribute a great deal to the really serious theoretical side of the problem. We are for the moment publishing these tables and their accompanying letters without detailed comment, because we wish them to be, as we feel sure they are, attentively studied by others, from whom in turn we hope to receive further opinions and calculations.

The deduction made by our correspondent as to the relative efficiency of the Blériot is noteworthy, and without presuming to have in any way thoroughly investigated all the points of the table, one fact is prominent—viz., that the Blériot is the only monoplane included that does not embody the dihedral angle in the design of its planes. Only quite recently we heard a prominent aviator give expression to his personal opinion that whatever merits the dihedral angle might possess, efficiency was certainly not one of hem. We merely mention this point as it would be interesting to ave the opinions of others on the same subject, especially in view f the figures given in the above table.—ED.]

TWO CORRECTIONS.

[336] In your issue of January 15th, p. 37, theoretical efficiency is given = $V \div (V - 0{\cdot}5\,v)$: this should be $V \div (V + 0{\cdot}5\,v)$.

In January 22nd issue on p. 59 the momentum imparted downwards to the air is given = $\frac{\text{breadth of plane} \times L \times \text{density} \times V^2 \sin a.}{g}$

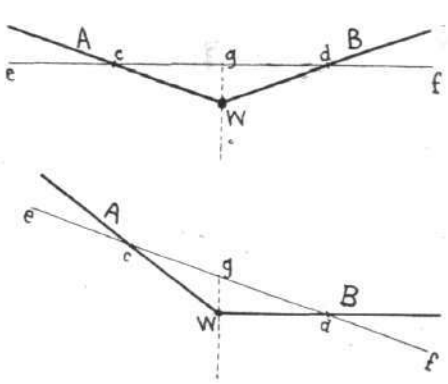
Here evidently 'L' is a misprint for 'l.'

Regent Street. A. G. H.

[We thank our correspondent for drawing attention to the misprint in our article on Propellers. The efficiency should be as stated in the above letter. The other correction relates to an article by Messrs. J. P. Chittenden and L. H. Robinson, but it is obvious from the context that the above correction is again in order.—ED.]

DIHEDRAL ANGLE.

[337] My idea of the solution of this problem is as follows:—The pressure on the planes must be at right angles to them, therefore the resultant force must bisect the angle, thus there is no



righting couple due to the dihedral angle itself, as has been explained.

My theory is that the dihedral angle is a simple method of raising the centres of pressure c and d. The effective area of A and B is equal to a horizontal plane, e, f, thus when the dihedral angle tilts over, the weight, W, acting vertically downwards, brings weight to g, thus $g\,f$ being greater than $g\,e$ the plane must tend to right itself.

I think the dihedral angle is not so efficient as a horizontal plane, as the area of A and B is greater than area of $e\,f$ for the same support, thus causing greater skin friction and weight.

Poplar. G. E. PAGE.

P.S.—Could any reader kindly give me the pressure on a curved surface at an angle of incidence of 12° as a fraction of pressure at 90°, and say if this is too great an angle for gliding?

SURFACING, BY ROBERT-BAILLIE GALT.

[338] Referring to the above method of fixing the canvas, &c., to framework for planes, wings, tails, &c., p. 67, January 22nd, it is certainly the best I have yet seen suggested; but there is one item in the description with which I disagree—*i.e.*, the last paragraph, "most cloth will stretch when wet," &c.

May I suggest that while calico, canvas and similar fabrics really seem to stretch when wetted, and to have shrunk when again quite dry, the actual "stretch" is almost infinitesimal. What happens is, the individual strands (both warp and weft) actually swell when wet, and the whole piece seems to stretch, and if nailed on or otherwise fixed in that condition the surface will assume the normal condition of the fabric, and when dry become loose and "baggy" between the fixings. In fact, the same result is found with an ordinary clothes-line, which while quite "taut" when wetted, becomes loose and "swingy" when quite dry.

With your permission, Sir, and an apology to Mr. R. B. Galt, I beg to submit the following remedy for "bagging," which I have always found most satisfactory.

By all means wet the fabric, but instead of "normal" water, dissolve half-a-pound of "papering size" in "hot," not "boiling," water, and when nearly cold add sufficient cold clean water to make up one gallon in all. Then completely soak every portion of the fabric for a few minutes in the mixture, wring as dry as possible, pull out flat, stretch and fix as advised by your correspondent, and I feel sure that if carefully strained and nailed or sewn the result

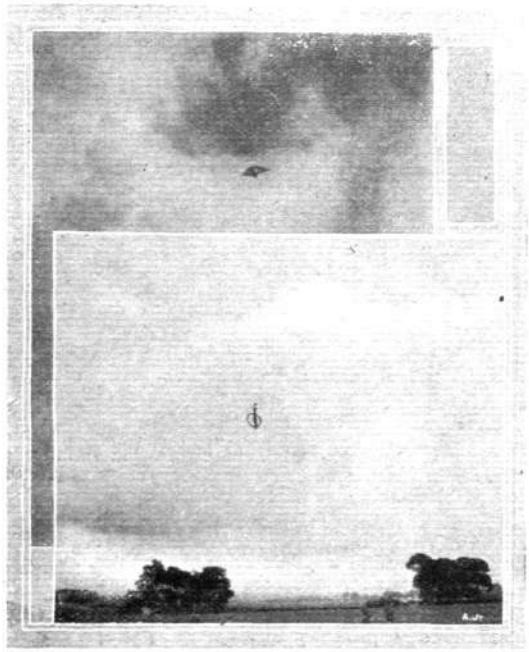
will be an even "taut" surface all over the framework, whether that surface be convex, concave, or both.

Should the "papering size" be unobtainable, take 4 ozs. of best cake Scotch glue, break up small, put in a clean jam jar, cover with water and let stand one night or eight hours, then turn away all water not absorbed, nearly fill jar with clean cold water, set in iron saucepan with sufficient water to reach nearly to top of jar, put a bent thick wire or anything in bottom of saucepan to keep bottom of jar from touching (this prevents burning the glue), bring to a boil on slow fire, frequently stirring the glue as it dissolves, boil half-an-hour and skim off scum as it forms on top, then simmer for one hour, then, while hot, fill up to one gallon, let cool slowly, and when quite cold use as advised.

Newport Pagnell. HY. BATH.

LARGE KITES.

[339] I am sending these two or three photos I took at a little fishing village called Bosham, near Chichester. Two of them are of my brother launching a 12 ft. kite. Another is of this kite in the air at the end of 100 yards of cord; and the last is of



Mr. Anson's big kite well in the wind, and below is seen the bicycle hoisted in the air.

my bicycle, an exceptionally heavy one, weighing between 35 lbs. and 40 lbs., being suspended in the air, my brother and I having hauled about 20 yards of the line down, hand over hand, and tied it on, when, on leaving go, it was easily lifted to over 15 ft. I think I may say that this kite is probably one of the only ones of its kind. In spite of its being 11 ft. 6 ins. high, and between 9 ft. and 10 ft. broad, it is only made with ordinary calico, instead of any other material that most aeroplanes and large kites are formed of. I must confess, however, though, that it is not nearly strong enough in comparison, as at the end of nearly every flight it has a tear where one of the pockets joins the calico. It weighs between 12 lbs. and 14 lbs. Its longest flight lasted for about half an hour.

Hoping these photos and little information may be of use for your magazine, FLIGHT, and of interest to you and your readers,

Lewes. W. G. ANSON.

ELASTIC MOTORS.

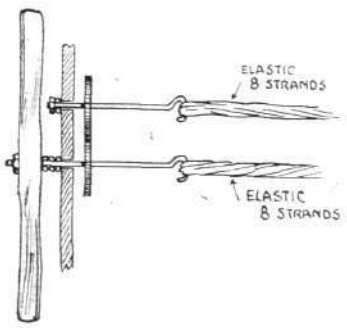
[340] I notice in your issue of January 1st a letter from G. R. Campbell with regard to my elastic motor.

I had not expected that any misunderstanding could have arisen either out of the description or the drawing, and as a proof of its efficiency, I notice that some enterprising firm of model aeroplane makers has adopted the system for at least one of their models (Blériot XI), and only a comparatively small propeller is used.

Mr. Campbell would like to know what I do "when the turns on the rubber get to the wide end of my wood frame." Well, the only answer I can give is to keep on turning (to a reasonable degree), and I think he will find that as the ends of the rubber stretch the more power is produced. As an example of the number of revolutions I can get out of it, I made one with a frame about 18 in. long and about 4 ins. wide at the driving end, and used six strands of $\frac{1}{16}$ in. rubber cord, and found that I could comfortably get 300 turns on it; but, of course, I have not tried it to a maximum.

Trusting I am not taking up too much room in your valuable paper,

Askern Spa. C. BELLAMY.



[341] In reply to "Aerosport," who is building a model biplane, I should advise him to fit two propellers running in opposite directions. He would then have sixteen strands of elastic to each propeller.

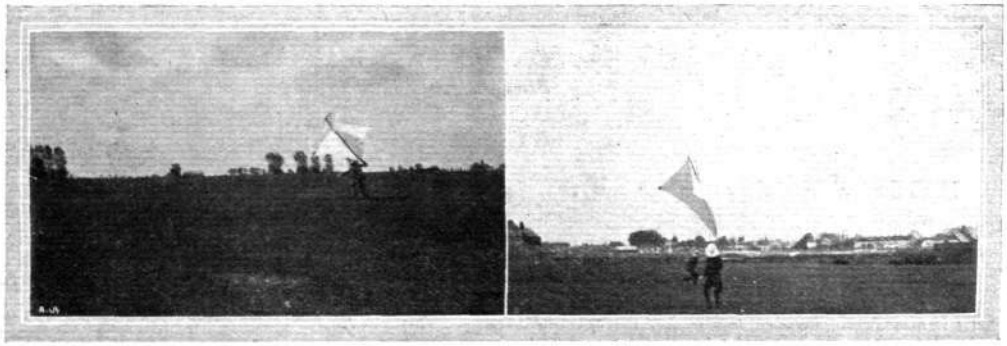
With regard to the amount of twist he would get, this depends on the quality of the elastic used. Better results would be obtained by using a geared motor as per sketch.

"RITA."

Sutton Coldfield.

RUTH PETROL ENGINE.

[342] I should like to know, through your valuable paper, if any reader has had any experience with the Ruth petrol engine. I am given to understand it is valveless and jointless, and should say it would be suitable for aeroplane work. Also should like to know the makers of the Ruth engine.



Mr. Anson launching his big kite.

I have built an aeroplane which carries 48 sq. ft. of canvas. What size engine should I require? Also how much lifting power is considered fair per square foot of canvas?

Macclesfield. F. MELVILLE STONE.

[We have no knowledge of the Ruth engine, but possibly some of our correspondents may be able to give the necessary information.

The next queries raised by our correspondent are unanswerable unless the weight of the machine is given, and the weight includes the engine. When the weight is known, the area, which has already been fixed, determines the speed of flight on the basis of a certain lifting efficiency per square foot. Dividing the area by the weight will give the lbs. per sq. ft. that *must* be lifted, and we suggest that our correspondent refers to a table that was published on page 297 of FLIGHT, Vol. I, where there is a good deal of theoretical information relating to lift and velocity.—ED.]

FARMAN SCALE MODEL.

[343] Replying to Mr. C. G. Jago, birch, No. 56, page 67, if straight-grained and free from all blemish (it should look like silk), when dressed for use, would be a most, perhaps *the* most suitable wood for such a model; but I think the size named, *i.e*, $\frac{3}{16}$ in., far too small for the long "body spars."

In the dimensioned drawing, now before me, of No. 42 of FLIGHT, I see the length is over all 39 ft.; now, while the four long body spars would not be that length on account of general shape of the body, your model spars would be about 30 in. long, so I would advise these to be $\frac{1}{4}$ in. thick by $\frac{5}{16}$ in. deep at the "front" end, tapering to barely $\frac{1}{4}$ in. square at the extreme back end, and if this is too large, then take off a shaving or two from both sides and top side of bottom spars and bottom sides of top spars, but only to some 5 in. or 7 in. from the back end, leaving the "middles" as they are, and, of course, slightly stiffer.

Am sorry I cannot help at present as to propeller, but will look up size of the Farman, and being just now engaged with study of and experiments with some model propellers, may perhaps be able to offer help in that direction later; at all events, I will try, with Editor's permission.

Newport Pagnell. HY. BATH.

MODEL MONOPLANE.

[344] Could you or one of your readers tell me what the greatest weight of a model monoplane, total area of lifting surfaces $1\frac{1}{2}$ sq. ft., can be for it to fly? Also, how much rubber would be necessary to drive it with an 8-in. Cochrane propeller? Wishing your valuable paper every success.

Putney. G. MACKAY.

FLYING GROUNDS.

[345] Perhaps you or some of your readers could enlighten me as to a good and suitable site for gliding experiments within reasonable distance of town; or whether such trials could be carried out by attaching the glider to a motor car at a moderate speed on a level road.

Russell Square. SUBSCRIBER.

Index and Title-Page for Vol. I.

THE Index and Title-Page for Vol. I, January to December, 1909, of FLIGHT, has now been published. Any reader may obtain one by sending $1\frac{1}{2}d.$ to the publishers, 44, St. Martin's Lane, London, W.C. After February 28th, a charge of 6*d.* post free will be made.

POINTS TO NOTE.

Chauvière Propellers.

MESSRS. C. GRAHAME-WHITE AND CO., LTD., of 1, Albemarle Street, inform us that they have obtained the exclusive agency for the United Kingdom for Chauvière propellers, and are able to deliver standard designs from stock. The new model Chauvière propeller is made with canvas-covered blades, the canvas being painted and varnished to a high finish to eliminate skin friction. Sample propellers will be shown at the forthcoming Olympia Show.

DIARY OF FORTHCOMING EVENTS.

British Events.

1910.		1910.	
Mar. 4-5 ..	Manchester Ae. C. Model Exhibition.	July 11-17	Bournemouth Flight Meeting.
Mar. 11-19	Flight Exhibition at Olympia.	Aug. 6-13	Flight Meeting, place not fixed.

Foreign Events.

1910.		1910.	
Feb. 6-13 ..	Heliopolis.	July 14-24	Rheims to Brussels, cross country event.
April 2-10	Biarritz.	July 24-Aug. 10	Belgium.
April 3-10	Cannes.	Aug. 25-Sept. 4	Deauville.
April 10-25	Nice.	Sept. 8-18	Bordeaux.
May 10-16	Berlin.	Sept. 24-Oct. 3	Milan.
May 14-22	Lyons.	Oct. 18-25	America. Gordon-Bennett Balloon Race.
May 20-30	Verona.	Oct. 25-Nov. 2	America. Gordon-Bennett Aeroplane Race.
June 5-12	Vichy.		
June 5-15	Budapest.		
June 18-24	St. Petersburg.		
June 26-July 10	Rheims.		

Aeronautical Patents Published.

Applied for in 1909.

Published February 3rd, 1910.

1,639. F. R. SIMMS. Aerial machines.
1,709. W. C. JOHNSON. Flying machines.
6,038. WOLSELEY CO. Driving-gear for aeroplanes.
6,966. G. A. CROCCO AND O. RICALDONI. Stability of airships, &c.
15,637. R. ESNAULT-PELTERIE. Aeroplanes.

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